

The measurements are as follows:—Length of the male averaging 7·25 in., of the female 7·10 in.; culmen 0·5 in.; wing 2·5 in.; tarsus 0·7 in.; tail in male 3·7 in., and in female 3·3 in. Bill black, legs brown, irides brown.

It remains to make some remark as to the distribution of these three species: *Pericrocotus stanfordi*, *P. roseus*, and *P. cantonensis*. *P. stanfordi* is found at Samshui, and thence as far west as Tak Hing, where it is replaced by *P. roseus*. Both these species are migratory, and both breed in their respective areas. *P. roseus*, which has not been noticed from China before, probably occurs through Kwang Si and Yunnan on into India.

Pericrocotus cantonensis was only met with once upon the North River, and is, in the writer's opinion, an accidental visitor to the region dealt with in this article. The range of *P. cantonensis* is further to the east and north—so far as is known—than that of the other two species.

What has been written as to habits and nidification under the head of *P. roseus*, applies equally well to *P. stanfordi*.

It has been suggested that *P. stanfordi* is a hybrid between *P. roseus* and *P. cantonensis*.

The type of *P. stanfordi* is, with all the other examples collected, now preserved in the Natural History Museum at S. Kensington.

XXI.—*The Evolution of Adaptation in Parasitic Cuckoos' Eggs.* By E. C. STUART BAKER, F.Z.S., M.B.O.U.

It is still sometimes a matter for argument and discussion as to whether the eggs of Parasitic Cuckoos have undergone, or are now undergoing, any process of adaptation in shape, size, or coloration, to render them similar to those of the foster-parents in whose nests they are deposited.

As regards *Cuculus canorus canorus* it is almost universally accepted as a fact that some such process is being slowly undergone, and that by it a most wonderful adaptation has already been arrived at in many instances. Thus we may

point to the striking similarity between some Pipits' eggs and the Cuckoos' eggs which are placed in their nests, or to the many cases in which the Cuckoos' eggs have been found in the nests of *Acrocephalus*, requiring quite a careful examination before it can certainly be decided that they are not aberrant ones of the Warblers themselves; or again, many blue eggs of *Cuculus canorus* have been found in nests of the Redstart, differing only in size and texture from the eggs of that bird.

But there are still ornithologists who declare that no such process of evolution is in existence, and that there is practically no law which governs the Cuckoo's practice as to where it places its eggs. These authorities, in order to enforce their arguments, point to the Cuckoos' eggs which are so often found in other birds' nests together with eggs with which they have absolutely nothing in common; and, if one oologist, trying to prove them wrong, says "How is it that so many blue eggs are found in Redstarts' nests?" the other side replies, "How is it that so many Cuckoos deposit their eggs in the Hedge-Sparrows' nests, yet so very few are found to be blue?" Both are right in what they say, only it is hardly fair to lay down general laws after a study of but one species, and, therefore, before drawing any deductions many species should be studied. Also it should be understood that in the case of the evolution of the Cuckoo's egg nature is working much as she works in other cases. Evolution here only means the elimination of the unfit; creation is the result of destruction, and the process of perfect adaptation is attained by the slow but sure elimination by the foster-parents of those eggs which contrast most distinctly with their own. It is not the Cuckoo that evolves a perfectly adapted egg but the foster-parents, which gradually eliminate the types of Cuckoos' eggs that are so ill adapted as to attract their notice. By this means those strains of Cuckoos which lay the most ill-adapted eggs gradually die out, whilst those that lay eggs most like these of the fosterer are enabled to persist.

Even this process is, however, checked or accelerated by

the comparative stupidity or cleverness of the fosterer selected, and this I hope to be able to show conclusively in the following pages.

I have now for many years past collected eggs of Asiatic Parasitic Cuckoos, and a study of the very many hundreds that have passed through my hands has produced sufficient material to satisfy me on the following points:—

1. That the eggs of the Parasitic Cuckoos have undergone, or are undergoing, a process of adaptation.
2. That the majority of foster-parents are totally unconscious of incongruity in size between their own eggs and that of the Cuckoo.
3. That they are not conscious of variation in shape.
4. That individuals do detect differences in coloration.

The species and the subspecies, the eggs of which have passed through my hands, or are now in my collection, are as follows:—

Cuculus canorus canorus; *C. c. telephonus*; *C. c. bakeri*; *C. saturatus*; *C. poliocephalus*; *C. micropterus*; *Hierococcyx sparveroides*; *H. nivicolor*; *H. varius*; *Cacomantis passerinus*; *C. merulinus*; *Penthoceryx sonnerati*; *Chrysococcyx xanthorhynchus*; *C. maculatus*; *Surniculus lugubris*; *Coccytes jacobinus*; *C. coromandus*; and *Eudynamis honorata*.

As regards *Cuculus canorus canorus* I can add nothing to the mass of information already recorded, nor have I seen a sufficient number of the eggs of *C. c. telephonus* to be able to draw any deductions therefrom; the few I have seen are indistinguishable from many of those of *C. canorus canorus*.

Of the next subspecies, however, *C. canorus bakeri*, at least a thousand eggs have passed through my hands, and in regard to these it is not difficult to formulate some propositions to which answers can be given.

Undoubtedly the favourite fosterer to be imposed upon by the Khasia Hills' Cuckoo is the tiny *Cisticola cursitans*, and of the vast number of eggs laid by *C. canorus bakeri* in the Khasia Hills probably more than half are deposited in the little ball-shaped nest of grass made by the Fantail Warbler. The fact that this is so would seem at once to go far

towards proving my second point in reference to the comparative size of Cuckoos' and fosterers' eggs, for anything more ridiculous than the sight of a Cuckoo's huge egg on the top of a clutch of *C. cisticola*'s it is difficult to conceive, yet the Fantail accepts the egg as her own and cheerfully undertakes the duties of incubation and its following troubles. At the same time I admit that there must be some reason for the comparatively small size of the parasitic Cuckoos' eggs generally, which would seem to point to the fact that amongst fosterers are here and there birds who are frightened by the formidable size of the intruder, and in consequence refuse to act *in loco parentis*.

As regards coloration, an inspection of a big series shows that the most common types of eggs of *Cuculus canorus bakeri* range from an egg coloured precisely like that of a *Cisticola*, *i. e.* white, sparsely speckled or spotted with reddish, to a very deep dull reddish egg with deeper mottlings or specks of the same colour.

Now, of the eggs which the Fantail Warbler is asked to incubate, the majority are either of the same type as its own egg or else somewhat approaching it in coloration; and it seems that in this case we have a slow process of elimination going on which will eventually result in only that strain of Cuckoo surviving which lays eggs agreeing in everything but size with that of the little *Cisticola*. At the same time this process has not advanced very far, and a large number of Cuckoos still continue to place eggs in the *Cisticola*'s nest which are very unlike those of the foster-parent.

A few Cuckoos of this subspecies also deposit their eggs in the nests of small Warblers, such as *Cisticola tytleri*, *C. volitans*, *Orthotomus*, and *Franklinia*; but it may well be that in these cases the Cuckoo mistakes the nests for those of *Cisticola cursitans*, which they closely resemble. It is, however, only odd eggs at odd times which are deposited in these nests, and I can trace no signs of any process of adaptation being in progress.

When, however, we come to the eggs placed in the nests of birds of the genus *Tribura*, there are good grounds for

supposing that the evolution has begun, for instead of finding that most eggs are of the white, sparsely spotted type most often found in the nests of *Cisticola*, we find that the majority are of a pinkish ground-colour densely spotted with red, much like, in fact, the eggs of the bird imposed upon.

Omitting *Cisticola*, the next most popular foster-parents are undoubtedly birds of the genus *Suya*.

All these birds—*S. crinigera*, *S. atrogularis*, *S. khasiana*, or *S. superciliaris*—lay very similar eggs, though of many types. The most common forms vary from white, but faintly tinged with pink, to a comparatively deep reddish, with spots, specks, and small blotches of deeper red either disposed in a ring about the larger end or distributed more or less profusely over the whole surface. Here the type of Cuckoo's egg most often obtained is neither the pale form found in the *Cisticola*'s nest nor the deep red-coloured one found in that of *Tribura*, but an intermediate type which assimilates very well with the most common form of the eggs laid by the fosterer.

Unfortunately for the Cuckoos the *Suyas* themselves are very erratic, and sometimes lay eggs which have a bright blue ground; but as only one such egg is laid in every ten or twelve, we should expect, if my theory is correct, to find, as is indeed the case, that evolution has followed the most useful line and that the Cuckoo whose strain is most dominant is the one whose egg agrees with the majority, not the minority, of *Suyas*' eggs.

Leaving the Warblers, the next most popular foster-parents are birds of the genus *Anthus*, represented in the Khasia Hills by *A. striolatus* on the higher ranges and *A. rufulus* lower down. Neither of these species is nearly so common as *Cisticola cursor*, *Suya crinigera* or *S. khasiana*, but fully 50 per cent. of the nests of *Anthus* obtained in the above Hills contain Cuckoos' eggs. Here, strange to say, I can find no signs of adaptation; and this is the more curious when we remember that in regard to the eggs of the European Cuckoo, it is between Pipits' and Cuckoo's eggs that we often find the closest and most remarkable likeness,

in some cases the Cuckoo's egg being hardly distinguishable from that of the foster-parent.

Birds far less often imposed upon than the above-mentioned Warblers and Pipits are the Silver-eared *Mesia* and the Red-billed *Liothrix*, yet we find very beautiful cases of adaptation to the eggs of these birds. Both species lay eggs which have normally quite a bright, pale blue ground-colour, spotted, often quite richly, with deep reddish brown and purple-black; yet different as these are from any common type of Cuckoos' eggs, I have taken quite a number of well-matched blue or bluish Cuckoos' eggs from their nests. The inference to be drawn here is that as a class *Mesia argentauris* and *Liothrix lutea* are intelligent birds, and accordingly refuse to sit on ill-matched eggs more often than most other birds do.

The eggs of Baker's Cuckoo are rarely found in the nests of other Babblers, though they may at odd times be met with even along with eggs so unlike their own as those of the Scimitar Babblers or of the little *Alcippe*.

A good many Cuckoos place their eggs in the nests of Shrikes; and here again adaptation has proceeded further on the road to completion than in most cases, doubtless for the same reason as with the genera *Mesia* and *Liothrix*, the process of elimination of wrongly coloured eggs being conducted by the foster-parents with more regularity and discretion. Many clutches of this species containing Cuckoos' eggs are beautiful examples of adaptation, whilst the contrast in the others between the lawful and the adopted eggs, if considerable, is seldom violent.

Flycatchers, more especially those of the genera *Stoparola*, *Niltava*, and *Cyornis*, are fairly frequently cuckolded, and the Cuckoos' eggs, in many cases, agree well with those of the fosterers named, and have probably already advanced a considerable way towards perfect adaptation; but at the same time they are still often wrongly coloured, and when deposited in the nests of *Rhipidura* and certain other Flycatchers, as they occasionally are, it can only be said that the parent Cuckoo must have placed them there by mistake, or because

she was tired of carrying them about in her mouth any longer.

We also find that the egg of this Khasia Hills' Cuckoo generally assimilates well with those of the smaller Thrushes, Chats, Forktails, etc., with which it is often placed, more particularly with those of *Notodola*, *Henicurus*, and *Rhyacornis*, birds of which three genera are usually selected to have the honour of hatching the young Cuckoo.

On the whole, therefore, it appears that the foster-parents of the Khasia Hills' Cuckoo have achieved some success in the process of elimination of eggs contrasting with their own, but there is still much to be done, and they are greatly handicapped by the fact that so many of the foresters selected are themselves variable in the colours of their own eggs.

Cuculus micropterus is a bird about which I will say nothing, for, though I think that there is no doubt that this Cuckoo lays a blue egg, like the blue type of egg of *Cuculus canorus canorus*, it is not yet so proven beyond all question.

Cuculus saturatus is a Cuckoo of which we have oviduct eggs, and the very few eggs of this bird found in nests are practically all exactly of the same type, *i. e.* pure white elliptical eggs, with a few tiny specks of reddish scattered over the whole surface. These, so far as we know, are generally laid in the nests of Warblers, such as *Phylloscopus trochiloides*, and other birds which lay either pure white eggs or white eggs more or less spotted. Osmaston, however, found two eggs in nests of *Niltara sundara*, and I have taken an egg from the nest of this species and others from nests of *Stoparola* and *Henicurus*, and one from the nest of a *Pomatorhinus*.

Of *C. saturatus*, therefore, we may say that she has had her eggs adapted to those of the class of the foster-parent most often victimised, but that she still occasionally gets other birds to accept and hatch her eggs.

Cuculus poliocephalus.—In regard to this bird also we are on quite safe grounds in drawing conclusions, for here, too, we need only base our conclusions upon eggs which are identical in all respects with oviduct specimens. These are

of two distinct types—one pure white, or, in the rarest of instances, extremely faintly marked with pink specks, and the other in colour ranging between a bright terracotta-red and deep chocolate.

The foster-parents of the white type are generally Warblers of the genera *Phylloscopus*, *Acanthopneuste*, and *Cryptolopha*, all of which lay white eggs, but the white type has also been taken on one occasion from the nest of *Lophophanes*.

The fosterers of the red type are birds of the genus *Horornis*, *Prinia flaviventris*, *Oligura castaneicoronata*, and *Tesia cyaniventris*, which themselves lay red eggs, but red eggs have also been taken in the nests of *Stachyridopsis*, *Dymochares cruralis*, *Niltava*, *Cyornis*, *Pratincola*, *Orthotomus*, and *Tribura*.

In the vast majority of cases in India, however, we find that the dark eggs are placed in the nests of some species of *Horornis*, whilst further east, in Japan, they are almost invariably placed in the nest of *Cettia cantans*; in fact, Mr. Allan Owston, from whom I procured a fine series of these eggs, tells me that he has never found them in any other nest. Mr. S. Whymper certainly found a very deeply coloured red egg of this bird in the nest of *Phylloscopus affinis*, but *Horornis pallidus* was very common in the vicinity, and doubtless a bird of this species should really have been the fosterer selected.

I have also had eggs sent me by dealers and others as being specimens of this Cuckoo's eggs, but they not only do not agree in coloration—which in eggs of the *Cuculidæ* is of no importance—but they do not agree in size, shape, or texture, and, so far, there is no evidence to show that the eggs of any one of the many species of Cuckoo vary in these respects.

Penthoceryx sonnerati.—Of this bird there is but one oviduct egg in existence, so far as I am aware, and this is in the collection of Mr. J. Davidson. I have, however, a considerable series of eggs which very closely resemble this oviduct egg and which certainly are Cuckoos' eggs, and which, by the process of elimination, can be fairly

satisfactorily proved to belong to this bird. Besides the oviduct egg referred to, Mr. Davidson obtained others in the nest of *Otocompsa fuscicaudata* and *Dumetia albigularis*.

Mr. T. R. Bell several times found *Egithina typhia* feeding young *Penthoceryx*, and once found a Cuckoo's egg in an Iora's nest which he described as rather like an egg of the foster-parent, but bigger and elliptical in shape.

The majority of the eggs I have taken, and which I believe to belong to this Cuckoo, have been found in the nests of *Alcippe nepalensis* and *A. phayrii*, and I have also eggs taken from the nests of *Turdinus abboti*, *Turdinulus roberti*, *Stachyris nigriceps*, *Orthotomus sutorius*, and *Stachyridopsis rufifrons*. The eggs they most nearly approximate are those of *Alcippe*, and it is probable that many of this Cuckoo's eggs are passed over because they are so exactly like the others in the nest. Here adaptation in so far as the *Alcippe* eggs are concerned may be accepted as practically complete, and in regard to *Turdinus* and *Turdinulus* as quite sufficient to ensure survival. In other cases they may be considered to be mistakenly placed.

Cacomantis passerinus and *C. merulinus* both normally lay eggs which can hardly be distinguished from many varieties of *Saya* eggs that I have already described; and from the description given it will be seen that when the Cuckoo has had the luck to put its egg in with the right variety of *Saya*'s egg, it is hard to tell one from the other. As a rule, however, the Cuckoos' eggs are considerably bigger, more elliptical in shape, and of a somewhat softer and finer texture.

In eastern India *C. merulinus* puts its egg, in at least four out of every five cases, in the nest of the *Saya*, and in regard to this bird's egg, adaptation is as far advanced as we can ever expect it to be. The other fosterers selected are nearly always either *Orthotomus* or some species of *Cisticola*. The western form, *Cacomantis passerinus*, also usually selects these birds' nests for its eggs. In both of these cases the fosterers' and Cuckoos' eggs agree very well, though the latter are much the larger.

In Hyderabad, however, we find quite the most wonderful case of adaptation occurring amongst the eggs of parasitic Cuckoos. In this town in the Deccan and the surrounding country, the most common little Warbler appears to be *Prinia socialis*, belonging to that section of the genus which lays a brilliant brick-red egg. The Plaintive Cuckoo (*C. passerinus*), having decided that this bird is, locally, the best fosterer, accordingly puts its egg into the Warbler's nest, but elimination has here gone on until it has evolved a red egg, quite near enough in colour to deceive the foster-parent.

A series of these eggs is especially interesting as showing fairly clearly how adaptation of the Cuckoos' eggs is arrived at, for although the extremes of the types are startling in their contrast, eggs are obtained which show intermediate stages of development.

Judging from a series such as this, it would appear that amongst the many individuals upon which these Cuckoos foist their domestic duties there are a considerable number which do detect the differences between their own eggs and the Cuckoos' eggs. When the differences are very conspicuous, some of the eggs get left unattended to, and the strain which lays them dies out, whilst those which lay the less conspicuous eggs increase in numbers. Thus from generation to generation the process of elimination goes on until a state of perfection is arrived at, which suffices to invariably deceive the bird it is intended to cuckold. In this instance we have the Plaintive Cuckoo, which normally lays a very different egg, here in the Deccan gradually reduced to a strain of birds which lay red eggs not very unlike those of the locally most popular form of foster-mother.

Hierococcyx nisicolor.—If we are to judge by the degree of perfection arrived at in the adaptation of their eggs to those of their fosterers, then the genus *Hierococcyx* must be held to be the oldest form of Cuckoo, with the exception of the genus *Coccytes*, for the eggs of all three of our Indian forms—*H. nisicolor*, *H. varius*, and *H. sparveroides*—have undergone a process of elimination long enough to

leave only those survivors who have been most successful in laying eggs of an appropriate colour.

The Small Hawk-Cuckoo (*H. nisicolor*), which lays long elliptical eggs of various shades of olive-brown, more or less mottled or spotted with reddish, has a rather wide range of fosterers; but the majority of these will be found to lay eggs of a very indefinite kind of colour, such as olive-brown, olive, reddish brown, etc., with which the Cuckoo's own eggs very closely agree. Eggs have been taken from the nests of *Stachyridopsis rufifrons*, *Arachnothera longirostris*, *Turdinulus*, *Pellorneum mandellii*, *Alcippe*, and *Drymocataphus*, but the favourite fosterers are Flycatchers of the *Niltava* and *Cyornis* groups, more especially the latter.

Hierococcyx varius lays plain, rather dark, blue eggs, which correspond more closely, perhaps, to those of the ordinary fosterer than do those of any other Cuckoo, and its eggs may be found in the nests of almost every member of the genera *Argya* and *Crateropus*. It is very hard to distinguish the Cuckoo's egg from the eggs of these Babblers, so closely do they resemble one another in size, shape, and colour, and even in texture the Cuckoo's egg is not nearly so well differentiated as is generally the case. It is only when one gets well outside the ordinary breeding-limits of this Hawk-Cuckoo that one finds it placing its eggs in nests other than those mentioned: thus in the Khasia Hills, low down near Sylhet and Kamroop, I have taken a few eggs in the nests of *Garrulax moniliger*, one or two in the nests of *Trochalopteron chrysopterum*, *Actinodura khasiana*, and a single egg from the nest of *Niltava macgrigoriæ*. With this last exception and one other egg sent to me from Travancore, which was taken in the nest of *Irena puella*, all have been placed in nests of birds laying blue eggs, with which the Cuckoos' eggs agree very well.

Hierococcyx sparveroides, the third species of Indian Hawk-Cuckoo, lays two kinds of eggs: the first and most common kind is a richly coloured olive-brown egg which is almost invariably laid in the nest of *Arachnothera magna*, a Spider-Hunter which itself lays an egg of the same colour, shape,

and texture, differing only in being much smaller and more glossy. So rare are the exceptions to this rule that I think we may take it as a fact that when the Large Hawk-Cuckoo places her egg in other nests, she only does so by mistake or in an emergency.

The second type of egg she lays is much like the first in shape and texture, but is generally a good deal bigger and is a bright pale blue-green quite unspotted. The first egg of this kind found was taken by Colonel Rattray from the nest of a *Myiophoneus*, but this must have been an unusual nest to select, as no others have since been taken from it. The birds appear, in their western range, to place their eggs in the nests of *Trochalopteron lineatum*, *T. nigrimentum*, *T. erythrocephalum*, and *Ixops nepalensis*, whilst in their more eastern habitat they are deposited in the nests of *Garrulax moniliger*, *G. pectoralis*, and *Trochalopteron chrysopteron*.

Here we have exhibited a form of parallel evolution by elimination, the one strain of Cuckoo placing its blue egg in the nests of several species of birds laying similarly coloured eggs, and the other surviving strain laying olive-brown eggs in the nests of a single species which also lays eggs of the same uncommon colour.

The next genus of parasitic Cuckoo contains two species, *Coccytes coromandus* and *C. jacobinus*.

Coccytes coromandus lays but one type of egg, a large, very spherical blue egg of a silky texture and very fine grain, which cannot possibly be mistaken for any other kind of Asiatic Cuckoo's egg, except in the case of very abnormally small eggs which might be as small as abnormally large *C. jacobinus* eggs. The usual fosterer which has to entertain the young Crested Cuckoo is one or other of the Laughing-Thrushes, which lay blue eggs similar to the Cuckoo's own egg. The principal among these are *Garrulax moniliger*, *G. pectoralis*, *Trochalopteron squamatum*, *Grammatoptila striata*, *G. austeni*, and *Trochalopteron chrysopteron*. On rare occasions only are they placed in the nests of *Actinodura ianthocincla* or *Garrulax leucolophus*, or similar unsuitable nests. Here the elimination of the unsatisfactorily coloured

eggs may be accepted as being completed ; and it will be seen that the process of adaptation has evolved an egg which agrees most closely with the eggs of *Garrulax moniliger*, *G. austeni* and *G. striata*, the normal foster-parents of the young *Coccytes*. The rare occasions in which they are not placed in the nests of Laughing-Thrushes which lay blue eggs are probably mistakes, being so placed by the Cuckoo before there are any of the fosterers' eggs in the nests, or because, though there are eggs, she herself cannot distinguish their colour.

Coccytes jacobinus, throughout the greater part of its range, selects the same nests as does *Hierococcyx varius*, and though their breeding-season is not the same, there is an overlapping period when eggs of the Hawk-Cuckoo, the Pied Crested Cuckoo, and the foster-parent may be found in the same nest, the majority quite indistinguishable one from the other ; all are blue, and all of much the same size, texture, and shape.

The smallest of our Indian parasitic Cuckoos, of the genus *Chrysococcyx*, also give us a most beautiful example of adaptation. We have no oviduct specimens of these birds' eggs, but to Messrs. A. Primrose and Chas. M. Inglis we owe an equally good proof of identity. These two gentlemen discovered a place where the little Sun-bird *Ethopyga scherie* was breeding very freely, and in many of the nests they found that there was one egg exactly similar in colour to the Sun-bird's egg, but decidedly larger. Specimens were sent to me, and in response to my request an egg was left *in situ* and hatched ; when, later, the almost full-grown bird was sent to me, it proved to be a specimen of *C. maculatus*.

Here we have a small metallic-coloured Cuckoo depositing its eggs similar, in all respects but size, to those of the Sun-bird, in the nest of a bird the cock of which is also metallic-coloured.

Since this discovery was made I have obtained other eggs of this and of the Violet Cuckoo (*C. xanthorhynchus*) in nests of *Arachnothera longirostris*, with eggs of which they agree fairly well, and in the nests of *Orthotomus* and *Cisticola*, with eggs of which they do not agree at all. The proper fosterers for this Cuckoo are undoubtedly birds of the genus *Ethopyga*,

and I have eggs from the nests of *E. seheriae*, *E. gouldiae*, and *E. saturata*, in regard to which adaptation may be considered complete.

The only other Indian parasitic Cuckoo which it is necessary to mention is the Koel, *Eudynamis honorata*, which lays its eggs in the nest of the Indian Crow, *Corvus splendens*, its Burmese cousin, *C. insolens*, or in that of the Jungle-Crow, *Corvus macrorhynchus*. In addition to these I have also records of its eggs having been found in the nest of *Pica sericea* in Burmah. The Koel's eggs agree very well with those of all these fosterers, and it is also noticeable that its eggs are not small for the size of the bird; diminution in size is not necessary, as the Crows' eggs are bigger than its own.

The foregoing notes will possibly suffice to show that from the numerous and varying types of eggs laid by parasitic Cuckoos those eggs which contrast most vividly with the eggs of the foster-parents are being gradually eliminated. In some genera and species, such as *Coccytes*, which we may therefore presume to be one of the oldest forms of Cuckoo, this process of elimination has been going on for so long that the Cuckoos who originally laid ill-adapted eggs have died out, whilst those which laid eggs closest in appearance to the fosterers have survived, succeeding generations of the latter having finally eliminated all abnormal strains until almost perfect adaptation has been secured. Especially in the remarkable adaptation of the egg of *Cacomantis merulinus* to suit the bright red egg of a special foster-parent within a small range of country, we have a case which the opponents of evolution in adaptation will find very hard to get over.

Before concluding I should perhaps say something in answer to the non-evolutionary theorists, who assert that the whole of the contention that foster-parents do sometimes refuse to incubate Cuckoos' eggs is only an illusion. That some birds do so refuse would, however, seem to be partly proved to be true by the fact that I have sometimes found nests, containing a Cuckoo's egg, deserted by the

rightful owners, and that in such cases the Cuckoos' eggs have contrasted very strongly with the others. Such nests I have come across in the case of species of *Suya*, *Cisticola*, *Horornis*, *Garrulax*, *Mesia*, *Liothrix*, *Anthus*, and, finally, *Lanius*; and in this last case it looked as if the Shrike, in a fury at the deception attempted on itself, had itself broken the Cuckoo's as well as its own eggs, since all were smashed, evidently by a bird's bill.

In another case two nests of *Anthus striolatus* each containing a Cuckoo's egg were found deserted. The nests were close together on "The Peak" near Shillong, and the Cuckoo's eggs, evidently laid by the same Cuckoo, were of the white boldly speckled type, quite unlike the dull brown eggs of the Pipit. Again, it must be remembered that deserted nests with eggs are not often found, which is hardly to be wondered at, for vermin soon dispose of any eggs which are not well protected. Again, nests found only a day or two after desertion do not in any way show the finder that they have been deserted, for the parent birds often hang about the site of a deserted nest for days after they have made up their minds to leave it. In addition to all this, however, it must be noted that there are also occasions on record in which a bird has built a second nest actually on the top of the first, rather than hatch a Cuckoo's egg laid in that first made.

XXII.—*On the Linnean Names Strix funerea and Anser erythropus, and on the Species which should be referred to them.* By DR. EINAR LÖNNBERG of Stockholm.

IN the tenth edition of the 'Systema Naturæ,' 1758, the name *Strix funerea* was given by Linnæus to a Swedish Owl, which, according to the quotation by the author himself, is described as no. 51 in the 'Fauna Svecica,' 1746. In the latter work we find for species no. 51 a short diagnosis, a quotation "Rudb. pict." . . . , and a description. "Rudb. pict." refers to the coloured plates which Professor Olaf